USDA-ARS KB Research Update

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NC-1015 Research Areas

- Epidemiology
  Charlie Rush, Texas A&M (Also overall NC-1015 Chair)
- Resistance breeding
  Jackie Rudd, Texas A&M
- CIMMYT/PAU cooperative screening programs
  Art Klatt, OSU
- Biotechnology/molecular markers
  Bob Bowden, USDA-ARS
- Alternative crops and practices
  Gaylon Morgan, Texas A&M
- Alternative marketing
  Tim Herrman, KSU
- Administrative Advisor
  Forrest Chumley, KSU

Objectives of NC-1015

- Develop high yielding KB resistant germplasm adapted for the Great Plains region in cooperation with CIMMYT
- Develop new molecular markers for KB resistance genes to assist breeding programs
- Evaluate strategies to retain global wheat markets that meet export customer KB phytosanitary regulations
- Define Karnal bunt (KB) ecology and epidemiology to enable global deregulation of KB and minimize pathogen spread
- Evaluate alternative crops and cattle grazing management systems and develop economic decision aids to minimize the impact of KB

Breeding For KB Resistance

- Screen existing US varieties and breeding lines at CIMMYT and PAU.
- Incorporate known sources of resistance from Mexico and India into US breeding programs

Cooperating Breeders

Jackie
Rudd
TAMU

Allan
Fritz
KSU

Art
Klatt
OSU

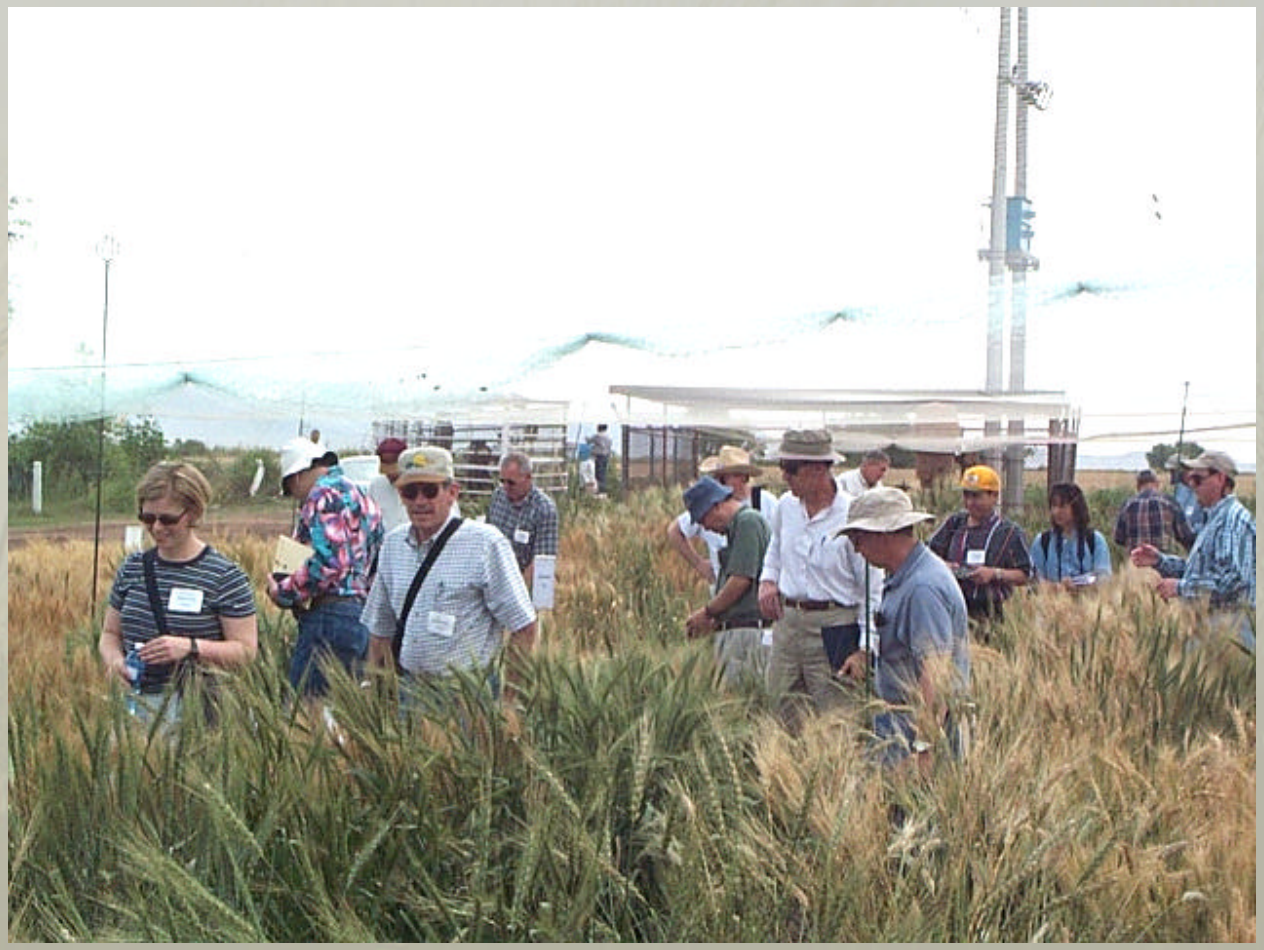
Punjab Agricultural University

Parveen Chhuneja (PAU)

Mist House

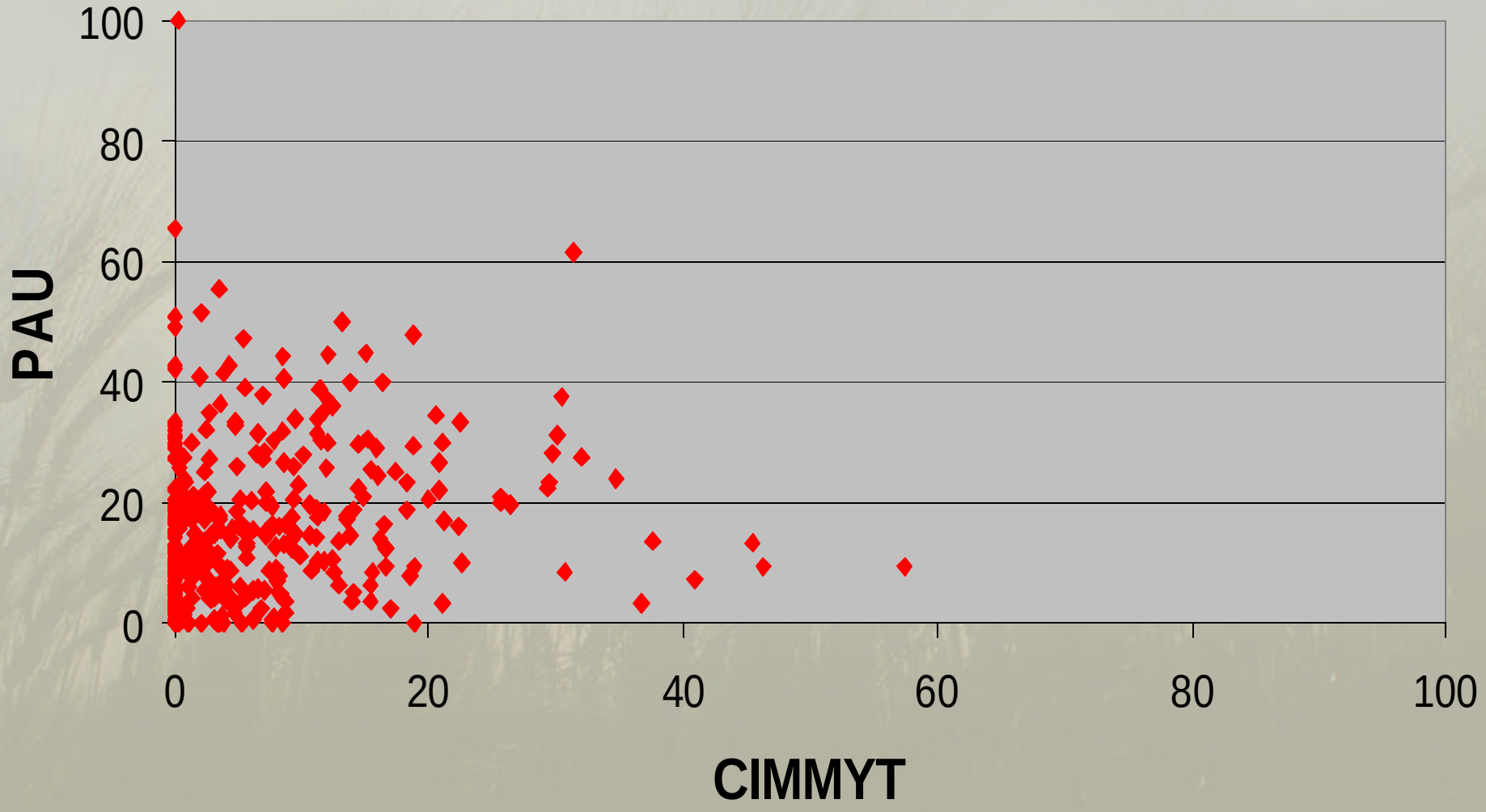
Misting System

CIMMYT KB Nursery



Guillermo Fuentes (CIMMYT & INIFAP)

Percent Infected Kernels 2003



Winter Wheat KB Screening Nursery

- 2002/2003- 1st WWKBSN
  - 400 entries from 14 winter wheat breeding programs
  - 32 looked mod. resistant & were retested in the 2nd WWKBSN
- 2003/2004- 2nd WWKBSN
  - 359 entries from 13 breeding programs plus 41 spring wheats
  - 35 of the 359 WW lines had low levels of KB infection at both sites in Mexico and in India, including 5 of the 32 lines that were re-tested from the 1st WWKBSN (1 from WPB, 3 from TX, and 1 from NY-a synthetic).
  - 20 of the 35 lines with low KB levels were from the materials from ARS-Manhattan, which is a Karl92/synthetic cross
  - 6 of the low KB lines were from Indiana and may be escapes
  - 3 Indian spring wheat lines gave 0% infection in Mexico
- 2004/2005- 3rd WWKBSN
  - 482 entries from 12 breeding programs plus 50 spring wheats

Immune Indian Wheat Line KBRL 22

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Short Communication

Inheritance of Karnal bunt-free trait in bread wheat

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With 1 table

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Abstract

A Karnal bunt (KB)-free wheat stock ('KBRL22') obtained from a cross of two resistant lines ('HD29' and 'W485') was used as a donor to introgress the KB-free trait into 'PBW343' (an 'Attila' sib), the most widely grown wheat cultivar in India. The number of KB-free and KB-affected plants in BC_1, BC_2, BC_3 and BC_4 as well the F_2 was recorded after artificial inoculations. The segregation pattern in these generations clearly indicated two independently segregating, dominant genes which jointly confer the KB-free attribute. The importance of the KB-free line generated in this experiment is discussed.

Key words: *Triticum aestivum* — *Neovossia indica* — Karnal bunt resistance

VEE#5'S') which is moderately susceptible. The PBW 343 registered average scores of 8.2–16.8% when tested over six seasons (1996–2002). The parents, F_1 and derived generations (F_2, BC_1, BC_2, BC_3 and BC_4) were space-planted in the field in different years and two to three ears per plant were inoculated with KB. Other ears from the inoculated plants were used to perform backcrosses in F_1, BC_1, BC_2 and BC_3 generations. Backcross seed from KB-free plants was retained for growing in the next season. Twelve *Neovossia indica* isolates representing pathogen variability from the Punjab State (Sharma et al. 1998) were maintained on potato-dextrose-agar medium and mixed in equal proportions to prepare the inoculum. The KB inoculations on parental lines and derived generations were performed in the field using the syringe method of Aujla et al. (1982). Appropriate humidity for disease development was maintained with the help of a perfo-

Markers associated- KB Resistance

Sukhwinder Singh, KSU & Bob Bowden, USDA-ARS

Marker	Chrom	R^2 (%)	P-value
Xgwm538	4B	19	0.0002
Xgwm149	4B	15	0.0003
Xgwm513	4B	18	0.0000
Xgwm371	5B	15	0.0003
Xgwm200	6A	22	0.0000
Xgwm58	6B	35	0.0000
Xbarc198	6B	26	0.0000
Xgwm88	6B	18	0.0000

Marker-assisted selection for KB

List of backcross combinations:

1 KBRL22/TREGO//NUHILLS
2 KBRL22/TREGO//TREGO
3 KBRL22/TREGO//KARL92*2/RAVI-36
4 KBRL22/TREGO//OVERLEY
5 KBRL22/KS940786-6-9//OVERLEY
6 KBRL22/KS940786-6-9//JAGGER
7 KBRL22/KS940786-6-9//CUTTER
8 KBRL22/KS940786-6-9//JAGALENE
9 KBRL22/KS940786-6-9//TREGO
10 KBRL22/KS940786-6-9//NUHILLS
11 KBRL22/KS940786-6-9//KS00HW34-1
12 KBRL22/KS940786-6-9//KS920709-B-5-2-2
13 KBRL22/KS940786-6-9//STANOF
14 KBRL22/KS940786-6-9//G980411W
15 KBRL22/KS00F5-14-7-1//JAGALENE
16 KBRL22/KS00F5-14-7-1//OVERLEY
17 KBRL22/KS00F5-14-7-1//NUHILLS
18 KBRL22/KS00F5-14-7-1//STANOF

Allan Fritz

Sukhwinder Singh